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Role of the Water Balance over the Mediterranean Basin on the Global Thermohaline Circulation

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We present the results of studies using an enhanced version of the GFDL Modular Ocean Model which quantify the role of the net evaporation in the Mediterranean basin on the global thermohaline circulation. Evaporation out of the Mediterranean Basin exceeds precipitation into the basin, equivalent to approximately 55 cm/yr net evaporation over the surface of the Mediterranean sea. Hence, there is a net flux of water from the Atlantic Ocean to the Mediterranean Sea. In the ocean GCM, this water flux is represented as a net salt flux from the Mediterranean Sea to the Atlantic Ocean, of about 1.6 Sv psu salt. The salty Mediterranean outflow is often cited as an important factor affecting the ocean's thermohaline circulation. The ocean can respond to enhanced fresh water transport out of the Atlantic Ocean in at least two ways: (1) by enhancing the salinity contrast between northward and southward flowing waters in the Atlantic, and/or (2) by enhancing the rate of thermohaline overturning. In the latter case, the approximately 0.6 psu vertical salinity difference in the Atlantic would suggest an approximately 3 Sv enhancement in the global thermohaline circulation due to Mediterranean outflow. We conclude that the Atlantic overturning rate is modestly sensitive to the rate at which water is transported from the Atlantic Ocean to the Mediterranean Sea.

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